Development and Its Traffic Impacts:

Policy Tools for Baltimore City

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ABSTRACT

The current revitalization of Southeast Baltimore has led to rapid development generating traffic levels that are straining the existing road infrastructure. Baltimore currently faces the challenge of addressing these traffic impacts in a manner that fairly distributes the responsibility of mitigation between the City and developers and allows the City to better predict future impacts. This report highlights various tools from across the country that have been developed to manage the transportation impacts of development. These tools focus on planning practices, infrastructure financing, and transportation demand management. Baltimore's existing tools are also discussed and improvements are suggested to help the City better address the increasing pressures on the transportation system resulting from development. Opportunities for Baltimore to improve its current processes and policies are identified here, and the adoption of best practices from across the country are noted to show how these can be tailored to effectively address the needs of the City. The combination of existing tools, suggested improvements, and new opportunities will ultimately lead Southeast Baltimore and other sections of the City to have more effective transportation and development practices.

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LIST OF ACRONYMS

ADA – Americans with Disabilities Act
APFO – Adequate Public Facilities Ordinance
BDC – Baltimore Development Corporation
CBD – Central Business District
CIP – Capital Improvement Projects (Baltimore)
DOT – Department of Transportation
FHWA – Federal Highway Administration
LOS – Level of Service
MTA – Maryland Transit Administration
SNAP –Strategic Neighborhood Action Plan (Baltimore)
SDOT – Seattle Department of Transportation
TAPA –Transportation Access Plan Agreement (Boston)
TDM – Travel Demand Management
TMP – Traffic Mitigation Plan (Montgomery County)
TIF – Tax Increment Financing
TIS – Traffic Impact Study
TMA – Transportation Management Association
TMO – Transportation Management Organization
TRO – Trip Reduction Ordinance
TSP – Transportation Strategic Plan (Seattle and Baltimore)
URP – Urban Renewal Plan (Baltimore)

A. EXECUTIVE SUMMARY

The revitalization of Southeast Baltimore has led to rapid development generating traffic levels that are straining the existing road infrastructure. Various planning, infrastructure financing, and transportation demand management tools from across the country have been designed to manage the transportation impacts of development. Baltimore's existing tools can be improved to more effectively address the increasing pressures on the transportation system resulting from development. Recommendations on how to improve current processes and policies within Baltimore are shaped from best practices across the country and tailored to effectively address the needs of the City.

1. Planning

The identification of what tools exists, and where additional tools are needed can help to manage increased travel and the adequate implementation of necessary mitigation. As new developments continue to create new travel demands, developers and the City need to equitably share the responsibility for mitigating problems that arise from the development's new travel demands. Without this fair allocation of responsibility, the City will ultimately bear the burden of having to solely address network improvements with limited resources. It is important, however, that these mitigation requirements do not deter desirable development from occurring. Incentives, for example, can encourage growth in areas where development is marginally viable. It is also important to remember that while a single development may worsen existing transportation conditions, it is the combined impact from numerous developments that has created the condition.

In order to determine needed mitigation, Baltimore must understand (1) how the existing transportation network functions for various users, (2) where there is the ability to increase capacity, and (3) what transportation network options can accommodate the City's future vision. Transportation-land use models can achieve this by identifying the impacts of development scenarios during comprehensive and neighborhood planning. Based on the model's results, decisions can be made to determine whether the impacts of new development are desired and what potential methods of managing the traffic can be implemented before development arrives.

Comprehensive planning tools can improve Baltimore's understanding of the existing network capacity and future capacity needs. An understanding of the "big picture" provides a framework in which the City can think systematically about how to manage the network, ensuring that the most appropriate mitigation techniques are pursued. Both the City and developers must take responsibility for the successful implementation of mitigation techniques and determine an equitable way to address needed mitigation. It is likely that Baltimore will need to use a combination of infrastructure and travel demand tools to accommodate the additional travel created by the amount of development the City envisions. In a few cases, developers will need city-sponsored incentives, but for the most part, developers should consider traffic mitigation as their responsibility.

2. Infrastructure Financing

Adequate knowledge of existing conditions and desired outcomes is crucial in order to use both public and privately funded infrastructure projects to keep up with the demands

of the transportation network. Since there may be a few opportunities to increase roadway capacity for automobile travel, either through new infrastructure or traffic signalization improvements, it is important that Baltimore take a comprehensive and systematic look at where these opportunities may exist.

Structured programs like transportation impact fees take into account infrastructure demands caused by new development. The transportation impact fee program charges each development for a proportionate share of the new infrastructure (i.e. signals, roadways, sidewalks) needed to maintain an efficient system with the development's new demands. These fees can be used to extract the costs of building new infrastructure from all the developments that create the need for improved infrastructure. This program is especially useful for making sure that early developers pay for their impacts and do not leave the burden on the last developer whose later project may tip the scale of acceptable travel conditions.

Negotiated agreements are one tool that can be used to request specific mitigation techniques from a developer. Using negotiated agreements may be more appropriate when there are fewer developments or fewer infrastructure improvements to be made. Negotiated agreements also provide a level of flexibility that is not found with impact fees. This can benefit a city that is interested in using different mitigation tactics in different areas, such as pursuing infrastructure improvements in one area, while focusing on reducing parking and encouraging alternative transportation in another. Initially, developers may see negotiated agreements as a way to minimize their required mitigations since they are designed to be flexible. As long as the city has a clear framework for mitigation requirements, and follows these requirements, developers will realize that this is a standard part of doing business.

Tax increment financing, a tool currently used in Baltimore, uses new tax revenue to provide infrastructure and attract development that might not be financially feasible. In this case, the City is using expected tax revenue to pay for needed infrastructure, as opposed to having the development mitigate its own infrastructure demands.

3. Transportation Demand Management

For many older cities like Baltimore, it may be impossible to increase transportation infrastructure to accommodate more auto-oriented development. If new development is desired, new travel patterns will be needed. The City can accommodate more travel by increasing use of alternative modes of transportation or by changing travel behaviors to encourage shorter trips, travel at different times, or eliminate some travel all together.

Transportation demand management (TDM) requires travelers to change their behavior, which can be extraordinarily challenging. People must be able to see a personal benefit, often in the form of time or money savings and convenience, before changing their travel behavior. Acceptable alternatives need to be in place. Buses must connect places of interest, provide reasonable drive times and be clean, comfortable and safe. Pedestrians and cyclists should be able to feel safe when traveling. In addition, changing behaviors requires education and incentives to motivate people to try something different.

Successful TDM strategies require a balance of acceptable alternatives and City pressure to make changes.

TDM can be incorporated into negotiated agreements, adopted as a citywide requirement, such as a traffic reduction ordinance, or provided as a city-managed program with voluntary participation by individuals and/or employers. In order to be successful, Baltimore would need to create opportunities for TDM to be successful by incorporating supportive features into comprehensive and neighborhood planning, zoning, and citywide and departmental priorities both in operational and infrastructure expenditures.

4. Recommendations and Next Steps

The impacts from recent and future development in Southeast Baltimore and throughout the City require the implementation of both new tools and improvements to existing tools. Cities across the country have benefited from the use of comprehensive and neighborhood plans, build-out models, finance tools such as tax increment financing, and state, city and neighborhood-run demand management programs. Baltimore can adapt many of these practices (described in detail in this report) to lead to new programs and policies, which help shape a more effective and efficient transportation system.

The adoption of these new programs and policies will help Baltimore to better define how it does business and to prioritize activities (i.e., development, infrastructure improvements, resource allocations) that will contribute to achieving the City's vision. These improvements can be used to define the role of the developer in being responsibility for system improvements and will help the City to determine what actions should and should not be considered based on analysis of a larger, comprehensive vision.

B. INTRODUCTION

The City of Baltimore has a strong interest in better understanding how to manage the transportation implications of land development, particularly traffic volumes. Like many older eastern cities, the City of Baltimore saw a net divestment in the city in the 1960's through the mid-1990's, with growth predominantly occurring in the suburbs. In the last decade, some areas of the city – especially near the waterfront – have been redeveloping quickly, with the convergence of national trends towards downtown reinvestment and city-sponsored programs supporting downtown growth. It is now foreseeable that the demands of the additional traffic generated from this growth will soon outstrip the capacity of the existing road infrastructure. As a result, the City needs to consider new policies and tools that allow more efficient use of the existing transportation network and expansion of the network where feasible.

It is important to note that most options for improving Baltimore's transportation systems are limited by the long-standing built environment. While new traffic lanes may be feasible in a few places, in most areas, the City can only re-allot the exiting right-of-way.[1] Baltimore's existing transportation systems have, in the past, accommodated almost twice as many residents and jobs than they currently do. Travel patterns and preferences have changed significantly since that time and the transportation systems currently struggle to accommodate lower levels of travel. As more development occurs, reliance on the personal automobile will make traffic untenable; use of alternative travel modes will have to become more widespread.

C. PURPOSE AND OVERVIEW OF REPORT

Baltimore currently uses relatively few tools to analyze and address anticipated transportation impacts of development. This report identifies policy tools that Baltimore City can use to better shape where and how development occurs, and in doing so, manage its negative transportation impacts. While our study is geared to the southeast area of the City, these tools are designed to be applied citywide.

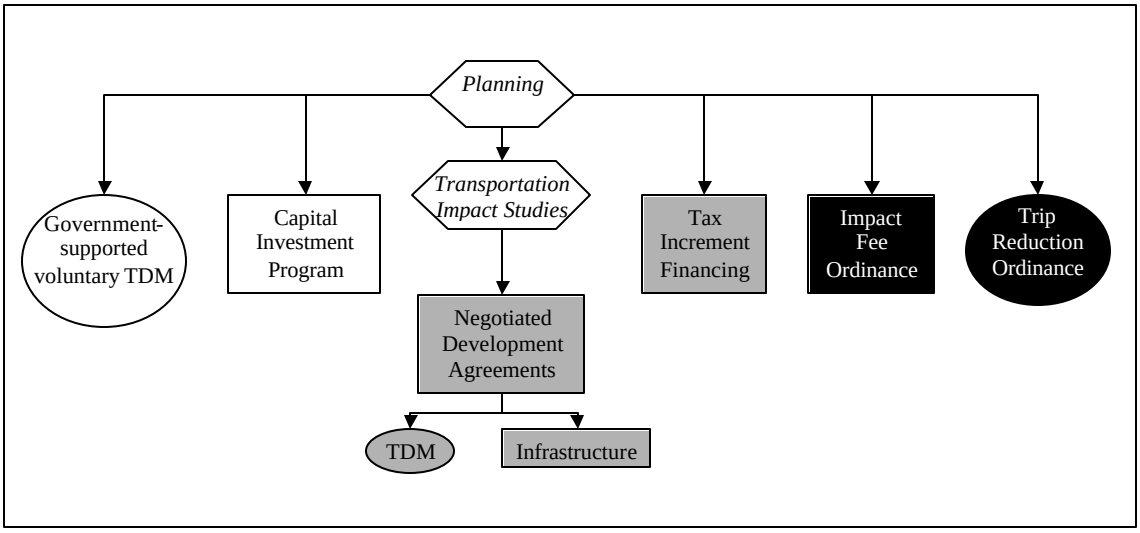
Three themes in managing the transportation system are highlighted in this report:

- **Effective planning -** to prepare for and manage changes in the transportation network;
- **Infrastructure financing** – to provide infrastructure improvements to accommodate existing and increased travel;
- **Transportation demand management -** to change behavior to encourage more efficient use of the existing infrastructure.

The following figure illustrates various options in accommodating infrastructure improvements (square) and travel demand management (ovals). Voluntary, flexible, city-

[1] Historically, southeast Baltimore has opposed major roadway projects. Plans for I-95, I-83 and I-70 were all significantly altered in order to avoid southeast Baltimore.

sponsored tools have light backgrounds and mandatory programs have darker backgrounds. Planning activities are italicized in hexagons.



The tools outlined in this report are organized into sections focusing on each of the three major themes - effective planning, infrastructure financing and transportation demand management.

Each section includes a description and:

a. An in-depth **analysis** of the tool
b. **Examples** of how different US cities apply the tool
c. Existing **application** of the tool **in Baltimore**.

D. EFFECTIVE PLANNING TOOLS

Effective planning processes and tools can help lead to more effective transportation decision-making. These tools do not directly affect transportation demand but provide a rational framework for the decision-making process, which can clarify city policies and can reduce citizen's frustrations.

1. Comprehensive and Neighborhood Planning

Comprehensive planning is an important tool in shaping the development of a city. It lays out the vision of the city and identifies tools that will move the city in that direction. Since the transportation network is vital to sustaining a city, many comprehensive plans include a chapter describing the transportation philosophy and priorities, often referred to as the "Transportation Element" of the Comprehensive Plan.

a. Analysis

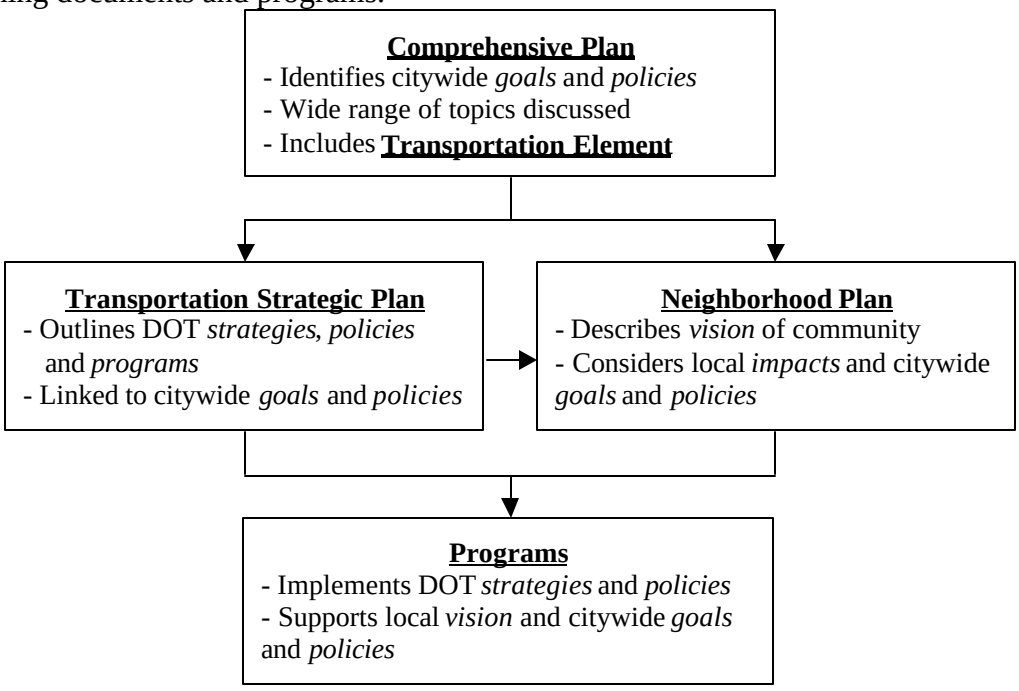
Comprehensive planning provides an opportunity to understand existing conditions and future expectations for the city. It provides an opportunity to consolidate and coordinate city policies, providing a single reference for city activities. This is especially important for transportation planning, which is heavily influenced by land use and development activities.

In addition to consideration of transportation systems in city-wide comprehensive planning, the department of transportation should develop a strategic planning document to provide a framework to organize transportation decision-making and prioritize transportation projects and needs. The transportation plan can include a description of current conditions and expected future demands on the network. In addition, the plan should set the stage for a clear understanding of the transportation priorities for city staff, residents and developers.

When questions from developers or citizens arise about specific decisions (i.e. why certain mitigations are required from developers or why a stop light will not be built at an intersection), city staff may rely on the policies set forth in the plan as a means to communicate their decisions. In addition, the planning processes used to develop the comprehensive plan and transportation strategic plan provide opportunities for the public to provide input on policies and programs, and a department of transportation can make its case for funding key projects and programs.

In addition to citywide planning, many cities develop neighborhood or area plans that describe the desired vision for a specific subsection of the city. Local residents are often more involved in development of local plans, compared to city-wide comprehensive plans, since they are more likely to connect them directly to the way they live and work. As a key aspect of livability, transportation and mobility need to be considered in the development of neighborhood plans.

The following figure illustrates the purposes and connections among transportation planning documents and programs.



It is important to remember that few people value a good transportation network as an end in itself, but rather as a component of economic vitality, safety and quality of life. In that regard, transportation links should be considered during all planning activities, especially those that include land use changes. Planning documents that discuss specific land uses and intensities of activity can provide enough detail to model the transportation impacts of the plan, both within the specific planning area and the impacts in surrounding areas.

Macro-transportation models can identify impacts of various development scenarios on the transportation network. These impacts should be considered in creating alternative development scenarios so that the city and community are aware of the consequences of each scenario. Surprisingly few planning initiatives include such an analysis, although they are becoming more common, especially during regional planning initiatives.[2]

One way to identify such impacts is to create a "buildout" scenario, which models what the region/city/neighborhood would look like if it were to develop to the maximum allowed by zoning. By modeling future traffic conditions, the city can determine whether the existing transportation network can absorb the additional development or if changes need to be made to either scale-back the level of development or to expand or refocus the existing transportation network. Neighborhood and land use planning activities should include a section on transportation that links expected mobility needs to desired mobility options. During the planning process, the city officials and community members can discuss the trade-offs of different scenarios, and develop a vision of how their community will function.

If additional transportation capacity is needed, potential options can be evaluated as part of a larger DOT capital investment program (CIP) decision-making process. In some places, higher levels of development may be desired, with an understanding that performance or level of service (LOS) the road network will be degraded. In other places, alternative transportation may be able to reduce the burden on the road network and may in fact be given highest priority on the roads. Understanding the transportation impacts of the comprehensive plan and transportation priorities allows the city to prioritize transportation approaches and programs. Prioritizing programs and activities based on the overarching goals ensures resources are allocated effectively.

b. Examples

Seattle's Transportation Strategic Plan (TSP)[3] is used as "the 20-year functional work plan for the Seattle Department of Transportation (SDOT)." It defines "both day-to-day operational and long-term transportation strategies and the projects, programs and services to implement them." Seattle's TSP is closely linked to the city's Comprehensive

[2] Envision Utah, Mid-Region Council of Governments' 2025 Metropolitan Transportation Plan (2003), Compass Project of the Southern California Association of Governments

[3] Seattle is currently in the process of updating its existing 1998 TSP. The TSP update is in response to the update of the Comprehensive Plan and success of many of the strategies outlined in the previous version. This paper cites the TSP Draft dated 10/12/2004. It is expected that the purposes of the TSP noted here will not change significantly before it is adopted, even if specific projects or programs are altered.

Plan Transportation Element, connecting DOT activity to the city's goals. Seattle's current TSP has shifted focus slightly from previous versions in order to focus more on citywide issues as opposed to earlier versions that focused more on policy and individual neighborhood needs.

Some of the purposes stated in the TSP Draft dated 10/12/2004 include:

- To prioritize resources and leverage project investments
- To describe the projects, programs and services that will be implemented through SDOT's capital budget and operation and maintenance budget
- To act as a central resource for planning tools and transportation-related data that are critical to sound decision-making for the area
- To assist other City staff, elected officials, partner agencies and the public in understanding the transportation system, funding realities, and steps SDOT will take to effectively manage the system.

Rationalizing and describing transportation priorities is a key component of Seattle's strategic plan. One of the main complaints identified in an SDOT customer service survey was that citizens did not understand where money was being spent. The TSP includes a section describing the four steps the SDOT uses in prioritizing projects for funding requests. Various programs and initiatives that are planned are identified and tied to the goal that they are intended to meet. This allows the city to request funds for these projects and citizens to monitor the City's actions to make sure that they are implemented.

As a comprehensive document, the TSP is a key reference document for decision-making at all levels of the transportation department as well as for city representatives (e.g., mayor, city council, boards), the planning department, and local transit agencies. Transportation employees have a set of standards to follow and can reference the TSP to communicate to the public why specific decisions were made.

The **Commonwealth of Massachusetts has developed "buildout" maps** for each community that illustrates current zoning and the quantity and location of land available for development. These maps provide a visual image of the potential impacts of existing regulations. For many communities the buildout maps provide the first clear understanding of the consequences of existing planning regulations, leading many communities to change their bylaws and zoning to better support the type of growth they actually want within their communities. While the buildout exercise in Massachusetts focuses on all the implications of development, not just transportation, it illustrates the fact that many communities accept land use zoning without having an understanding of the actual impacts of what it means. Creating transportation "buildout" maps for various scenarios during comprehensive/neighborhood planning allows citizens to understand the potential consequences of each scenario, prioritize their goals, and discuss mitigation strategies that will accommodate the desired development pattern and transportation opportunities.

c. Application in Baltimore

Baltimore does not currently have an adopted Comprehensive Master Plan guiding the city's policies and activities. In 1997, PlanBaltimore was initiated to develop a comprehensive master plan, which would be followed by neighborhood planning activities. A draft report was produced in 1999, but never finalized or adopted by the City Planning Commission. Efforts have recently begun to update the vision developed during PlanBaltimore and finalize a master plan with the theme "Live, Earn, Play, Learn," by the end of 2005.

Baltimore Planning staff have worked with local communities to develop neighborhood plans for Upton, Park Heights, and Locust Point. DOT was consulted on the transportation elements of these plans. Without incorporating transportation modeling or build-out analyses, the transportation elements mainly focus on existing transportation deficiencies as opposed to expected changes to the transportation system inherent in the plan.

In many areas of Baltimore, urban renewal plans (URPs) play the role of neighborhood plans. URPs provide legal mechanisms for the city to acquire property for redevelopment and approve zoning changes and overlays including the creation of local design standard. Changes to URPs require a public process that provides a forum for discussion of development in the region. Historically, transportation impacts have not been analyzed in the revision process.

In the southeast, urban renewal plans (URPs) exist for Fells Point, Canton Waterfront, Canton Industrial Area, Washington Hill, Jonestown, and Inner Harbor East. Major revisions occurred to the Canton Waterfront and Fells Point URPs in 1989 and development has generally matched the neighborhood vision developed at that time. Major modifications to the Canton Industrial Area URP also occurred around this time and were designed to preserve the industrial character of the area. Later amendments were made to allow for development of Canton Crossing and Brewers Hill. Over time, the URP for Inner Harbor East has incrementally increased densities and shifted development more toward commercial uses. Baltimore's desired to capitalize on interest in waterfront development has lead to the recent increases in allowed density within these neighborhoods. Unhappiness with new development may stem from a struggle to balance the desire for a community vision to be set in stone with a desire to allow the vision to change over time. Public participation within the URP update process allows for these discussions, although those preferring historical planning visions may feel that the updates ignore or negate the previous planning processes and require extraordinary vigilance on their part to keep things as they were previously agreed to.

In 2003, Baltimore DOT published the Transportation Strategic Plan (TSP) that identifies departmental goals and objectives and potential actions. As the TSP itself notes, "the goals must be pursued through a detailed set of strategies and actions, each of which must then be carried out through the Department of Transportation's projects, operations, and policies." It appears that while some of the actions identified in the TSP are being

implemented, the TSP is not used to prioritize or guide departmental activities. DOT needs strategically consider how various projects, operations, and policies are connected to departmental and citywide goals in order to effectively meet the goals. Additional analytical capacity, such as a transportation demand model, would allow DOT to understand existing conditions and model potential solutions in order identify and prioritize those projects that best meet these goals and objectives.

The U.S. Department of Transportation's Volpe Center is currently developing a transportation demand model for southeast Baltimore based on the Baltimore Metropolitan Council's Baltimore Region Travel Demand Model for Base Year 2000. This model will help the city visualize expected transportation demand associated with planned development, and will allow testing of certain mitigation strategies. While the model is capable of identifying areas of congestion and determining mode share for transit routes based on travel time, it has limited capacity for modeling behavioral changes and impacts of parking policies.

2. Multi-modal Roadway Classification and Design Guidelines

In built-up areas, it can be difficult to balance the various requirements of the transportation network. Many cities have recognized that streets play a larger role than just moving personal automobiles. Truck traffic is key to commerce; and bicycling, walking, and transit are key modes for providing choice and optimizing use of the transportation network. In some areas, other uses may take priority over transportation access. Examples include parking and unloading zones in commercial districts or quiet, low-traffic roadways in residential neighborhoods.

One tool that is useful for prioritizing roadway use is to develop a street system management plan that includes multi-modal roadway classifications and design guidelines. Roadway classification maps and design guidelines constitute the street system management plan by outlining the primary uses and design policies associated with balancing the various needs placed on each portion of the roadway network. Classifying or reclassifying roadways can be politically challenging. This is especially true when residential streets are reclassified upwards, such as for a truck route or through street. Discussing the street system as a network, instead of individual streets, and tying roadway uses to the types of roads needed, can help residents work with the city to meet both the need to move people and commodities and residents' concerns over traffic.

a. Analysis

Multi-modal roadway classifications amend traditional Federal Highway Administration (FHWA) Functional Classifications[4], which categorize roadways as arterial, collector and local roadways based on automobile carrying capacity, by adding additional classifications that consider adjacent land-uses and alternative transportation use.

Cities using street management plans classify roads by primary roadway purpose(s) such as providing through-access or serving the local commercial district, and create

[4] FHWA Functional Classification Guidelines. 1989 http://www.fhwa.dot.gov/planning/fctoc.htm

guidelines and standards for each classification. In addition to considering vehicle traffic, transit, pedestrian, bike, truck, and emergency vehicle use of streets are mapped to make sure that each modal network serves the city and local neighborhood appropriately.

The following scenarios show how classification systems can be used to rationalize a DOT's decision-making:

- In commercial areas, vehicle capacity may be sacrificed for parking and pedestrian access. Outside of the commercial areas, signals are timed to maximize vehicle flow.
- Bus stop spacing standards may change based on transit classification or adjacent land uses.

By mapping network priorities and developing guidelines associated with them, there is a common understanding of how transit and commercial, residential, and emergency vehicles will navigate a city. A comprehensive systematic process for classifying (or reclassifying) streets allows a city to analyze the impacts at a network level. When streets are changed one at a time, impacts on adjacent streets and the network as a whole may be missed.

b. Examples

Phoenix, Seattle and Portland, Oregon are three cities that have developed street system management plans based on multi-modal roadway classification. Some places, such as Chicago and San Diego, have developed design guidelines for specific street types, but do not have quite as detailed classification systems.[5]

Seattle uses its roadway classification system to guide transportation project planning, management and land use decisions. They have developed the Urban Village Transit Network, a set of key transit corridors that provide transit access to and between neighborhood centers. The city is working with the local transit authorities to provide high quality transit service along these corridors. Seattle has connected its development and transportation policies and now has a clear set of goals to work toward with local transit authorities.

San Diego uses descriptive street classifications to provide guidance on the use and design for streets within the Centre City neighborhood. Most streets are classified as Multi-use but the city also identifies Boulevards, Main Streets/Active Use, Green Streets, Bike Facilities, and Residential Streets. In addition San Diego identifies major and minor gateways as key areas. San Diego has designated those areas for which specific street uses should be considered when redesigning the street.

[5] Additional information on road classification systems, including maps can be found in the Bibliography.

c. Application in Baltimore

Baltimore last updated its road classifications in 1993 using the standard Federal Highway Functional Classification system. There is little consideration of the public right of way as an integrated, multi-modal network. Baltimore is taking the first steps in considering modal accessibility by developing a Bicycle Master Plan. Recently inaugurated, the Bicycle Master Plan process will identify a bicycle route network and improvements needed along that network to make sure that bicycling is a feasible mode of transportation throughout the city.

In response to citizen complaints, Baltimore has restricted through-truck travel from most of the southeast, but trucks are legally allowed to travel through this zone to make local deliveries. The truck restriction makes doing business difficult and having local trucks in a "no truck zone" frustrates citizens because they still see trucks rumbling by. A network-level review of truck routes would help direct local truck traffic, benefiting businesses and citizens.

For the most part, roadways are designed using traditional design standards that focus on accommodating the automobile. On a case-by-case basis, non-standard design elements such as bulb-outs, angled parking or bike lanes are included in roadway projects. There is no publicly available information to help citizens understand when or why various design features are or are not appropriate. Without publicly available standards, citizens may think that they are being treated unfairly.

Over time, roadway configurations have developed without consideration of adjacent land use or the overall traffic network. Pratt and Lombard, two primarily residential roads in the southeast, are configured as a pair of opposing one-way streets, a design that allows higher speeds and attracts through traffic.

3. Traffic Impact Studies

A traffic impact study (TIS) is a standard step in the development process because it provides the city and developer a prediction of traffic conditions that will occur once the development has been built. It is important to understand that a TIS is an estimate and cannot always accurately predict future conditions. In fact, industry-wide there has been relatively little post-development analysis of the accuracy of TISs. Still, TISs are the best tool DOTs have for estimating the impacts of specific developments on the adjacent existing transportation network and determining whether the existing network has adequate carrying capacity or if mitigations need to be considered. Without such an analysis, a development could create impossible traffic and parking woes, without providing the opportunity to prepare for the changes caused by the development.

a. Analysis

A TIS can be required by ordinance during any number of stages of development including rezoning, requests for subdivisions, site plan approval, building permits, planned use development processes, and comprehensive plan amendments. While a TIS may include different elements based on the size and expected impact of the development, basic study requirements and purpose should be made clear so that there is consistency between one study and the next. The level of detail and size of the study area

are often determined by expected traffic generation or the size of the development.[6] TISs generally consider the following:

- existing conditions
- traffic generation and trip distribution
- intersection capacity
- site access and queuing
- site circulation
- sight distance and safety

Including impacts of adjacent, concurrent, or proposed development can be a sensitive issue. Many developments change scale or uses during project development and may happen promptly or may be put on hold indefinitely, making it nearly impossible for a developer to accurately estimate the impacts of other development projects. Requiring a developer to include anticipated impacts of evolving development projects is especially sensitive when the developer in question is required to take specific mitigation actions that may be required in part due to the impacts of other proposed developments. By stating and observing consistent study requirements, developers will not feel that they are being singled out to bear an unfair level of responsibility.

Most TISs are completed not only to predict traffic generation, but also to propose mitigations to minimize traffic impacts. Mitigation of the impacts of development can be dealt with in a number of ways, with some being more supportive of the development and others requiring the developer to pay for some or all of the mitigation costs.

In some cases, mitigation requirements are based on existing roadway conditions while in other cases, the number of trips generated is used to determine what, if any mitigation is required. It is important to note that using level of service (LOS) as a mitigation threshold places the responsibility of mitigating traffic impacts on those whose developments occur when roads are nearing the threshold, but not those whose developments cause the congestion leading up to the threshold.

b. Examples

A handbook developed for communities in **Michigan** provides a model TIS ordinance.[7] Municipalities in Michigan are highly constrained as to what a city can require from developers and are not authorized to use impact fees. Since infrastructure development is constrained by city budgets, consideration of transportation network capacity in planning is crucial to preventing major imbalances between travel demand and roadway capacity. Having a TIS ordinance formalizes the process, ensuring that TIS requirements are legally sound and enforceable.

[6] 100 additional trips per peak hour is a common threshold for requiring impact studies.

[7] "Evaluating Traffic Impact Studies – A Recommended Practice for Michigan Communities" McKenna Associates, et. al. for Tri-County Regional Planning Commission, Michigan Department of Transportation and Southeast Michigan Council of Governments. 1994. http://ntl.bts.gov/DOCS/etis.html

c. Applications in Baltimore

Traffic impact studies are required for planned unit developments and are incorporated into the site plan review. Baltimore also requests TISs for new and redevelopment projects meeting or exceeding the following thresholds:

Use	Threshold
Residential	100 dwelling units
Warehousing	150,000 sq. ft. gross floor area
Other	50,000 sq. ft. *or* 100 peak hour vehicle trips

Basic TIS guidelines are incorporated into the development guidebook describing the purpose and expectations of the developer including data needs, traffic forecast assumptions, types of analysis and mitigation measures. TISs submitted to Baltimore provide a reasonable estimate of transportation impacts and generally incorporate impacts of adjacent developments.

Developers have been willing to provide mitigations such as traffic signals that improve site access. Developers have been less willing to support more complicated mitigation recommendations such as changes to roadway geometry or alternative transportation improvements. Many development impacts are never mitigated by either the developer or the city because the mitigations identified in TISs are only recommendations and not legally binding.

E. INFRASTRUCTURE FINANCING TOOLS

Building, maintaining and operating a city's right of way is crucial to maintaining and optimizing travel through a city. Cities often struggle to maintain existing transportation infrastructure and as development creates new trips, it places additional strains on the network. Infrastructure improvements such as additional rights-of-way, changes to roadway geometry, and new traffic signals or traffic operations systems may be required to absorb the additional travel and maintain adequate movement throughout the city. This section discusses tools for financing and implementing infrastructure maintenance and improvements to accommodate existing and increased travel. Both incentive- and "demand-" based tools will be discussed.

1. Development/Transportation Impact Fee Ordinance

Development/transportation impact fees are one-time fees paid by developers to offset the cost of infrastructure improvements needed due to increased transportation demands created by new development. They have become popular in rapidly developing areas where cities and counties struggle to keep up with the infrastructure demands of development. In addition to managing rapid development, impact fees can be used in combination with other tools to concentrate and direct growth into desired areas.

a. Analysis

Impact fee ordinances are required to show the correlation between the development and improvement fees. Application of the impact fee is legally sensitive. Legal precedents require the ordinances to show a rational nexus[8], or substantial link, between the development, required infrastructure improvements, and fees. Below is a list of some of the basic tenets of impact fees:[9]

- New development creates the need for improvements.
- A rational connection (or nexus) exists between a development project and the need for additional facilities.
- The development will benefit from the improvements it is funding.
- Impact fee funds may not be used to remedy existing deficiencies.
- The total revenue collected from all developers must not exceed 100% of the cost of the projects.
- Fees must represent a proportionate share of cost of the improvement associated with the impacts of each new development. Often, impact fees are calculated as cost per unit of new development.
- Credits and adjustments must be given for outside funding sources (such as federal and state grants, developer-initiated mitigation projects) and local tax payments that fund capital improvements.
- The collected funds are segregated from general revenues and earmarked to pay for specific improvements, within a reasonable time frame, and directly and primarily benefit users of the property on which the fees are imposed. Funds collected for projects that are not constructed should be refunded.

Significant planning must be done before implementing an impact fee. The following steps are typical of what is required to develop a legally sound impact fee. [10]

1. Define minimum level of service (LOS) standard for roadway facilities
2. Determine transportation impacts of development
3. Prepare a list of improvement projects and their costs
4. Establish a Capital Improvements Program
5. Calculate the fee
6. Describe the nexus between development, the fee, and the projects
7. Set administration and review procedures

[8]Rational nexus "is a moderate position between a standard that requires that the fee be 'specifically and uniquely attributable' to the needs created by new development, and the relaxed standard that the fee be 'reasonably related' to the needs created by development." from "Policy Guide on Impact Fees," American Planning Association, April 1997 http://www.planning.org/policyguides/impactfees.html

[9] Tenets derived from "Regional Transportation Impact Fee Study," Merced County Association of Governments, Oct. 16, 2003 (http://law.wustl.edu/landuselaw/ in articles) and "Policy Guide on Impact Fees", APA (http://www.planning.org/policyguides/impactfees.html).

[10] Based on: City of Albuquerque 2004 Roadway Facilities Impact Cost Study Summary Report. http://www.cabq.gov/council/documents/RoadwayFacilitiesIFReportandAppendicesFinal_000.pdf

8. Have impact fee procedures approved by city to begin implementation

b. Examples

Tampa is one of the larger cities to have an impact fee covering most of the city including the central business district (CBD). A few struggling neighborhoods have been exempted from the impact fee as a way to encourage redevelopment. The Tampa DOT impact fee coordinator noted that the economically depressed neighborhoods have had some success in redeveloping. While some of the investments may be in some part due to exemptions from the impact fee, the coordinator believed that generally high levels of interest in infill-development certainly also play a role. Considering the high interest in all types of development, the program coordinator did not feel that the high impact fees within the CBD had diverted investments in the area, although there has been slightly less office development than projected. It is important to note that impact fees are common throughout Florida, including Hillsborough County, which is adjacent to Tampa; this means most developers pay impact fees if they choose to develop in the State and cannot move their development to a nearby jurisdiction to avoid paying the fee.[11]

San Diego provides a complicated lesson in impact fees. When development impact fees were first implemented in 1987, they were applied to each community within the city. Soon after implementation, a number of communities identified as redevelopment areas were exempted from the fees. Slowly fees have been reintroduced to these neighborhoods as they have prospered. The last of the communities, downtown's Centre City, is currently reintroducing impact fees. While development impact fee exemptions were used as a redevelopment tool, the project manager for facilities financing for the downtown neighborhoods noted that the fees do not appear to have a negative impact on development rates.[12]

Many other cities that have development impact fees, including Albuquerque and Phoenix, do not apply the fees in their downtown areas. Phoenix has limited their development impact fee zones to high-growth areas that had minimal existing infrastructure. Since they must focus on new infrastructure, as opposed to maintenance and operations, there may be fewer opportunities to apply impact fee ordinances in already developed areas. However, equipment related to traffic management systems, such as traffic cameras, networked traffic signals and shared parking garages may offer opportunities to apply impact fees in developed areas with limited roadway expansion opportunities.

c. Applications in Baltimore

In Maryland, transportation impact fees are considered under the context of adequate public facilities ordinances (APFO),[13] which have been implemented in a number of cities and counties including Baltimore and Anne Arundel Counties. Maryland's Office

[11] Conversations with Mr. Mahdi Mansour, the Tampa impact fee contact, took place over the phone on Jan 19 and 25, 2005.

[12] Conversation with Ms. Evelyn Lee, San Diego Planning Department Facilities Financing Project Manager for downtown communities, took place over the phone on Jan 27, 2005.

[13] Incorporated into Article 66B §10.01 by the Maryland General Assembly in 1978.

of Planning developed *Managing Maryland's Growth Models and Guidelines #14: Adequate Public Facilities* in 1996 to provide guidance on the creation of adequate public facility ordinances. The *Adequate Public Facilities* guidelines include a list of impact fee ordinances in Maryland.

2. Tax Increment Financing

Tax increment financing (TIF) is a tool that captures the increased tax revenue created by specific developments and directs that money toward infrastructure projects serving that development district. A TIF provides the opportunity to leverage limited public financing of public infrastructure and site preparation in order to attract private investment. Payment-in-Lieu-of-Taxes is a similar program similar to TIFs.

a. Analysis

The increase in real property tax from the pre-development "baseline" is pledged to repay bonds issued to fund infrastructure improvements such as creating or improving roadways, public parking, and other public facilities within the designated TIF district. Simply, a TIF siphons new revenues towards projects within the TIF district, removing the revenue from the general fund. This provides dedicated funds for specific projects, ensuring the developer that improvements are made in a timely fashion. TIFs do not require projects to go through the standard means of funding, which can be time consuming and may not prioritize the desired infrastructure improvement.

TIFs are used as an incentive to developers as opposed to impact fees, which place the costs of public infrastructure improvements on the developer. In the case of tax increment financing, the "new revenue" is directed at specific improvements but is withheld from the general fund until the bonds are paid off. In contrast, infrastructure improvements made with impact fees do not directly benefit from the new tax revenue created by the development. In fact, in the case of Albuquerque, the incremental tax revenue increase goes to the city's general fund, and is subtracted from the required impact fee, which is paid directly to the department of transportation. The increased revenue must trickle through the city's general fund, back to the department of transportation before the DOT sees a benefit from the increased property value.

b. Examples

Since Baltimore currently uses tax increment financing, additional case studies were not identified.

***c.** Applications in Baltimore*

Baltimore has had tax increment financing authority since 2000 and has approved four TIFs in that time. The Baltimore Development Corporation (BDC) is responsible for reviewing TIF proposals initiated by developers.

The following guidelines are a few of those used by BDC in approving a TIF:

- Financing gap that can only be supported by government subsidy

  - Analysis of financing to determine whether there is truly a gap
  - Unique cost features (i.e. Brownfield)
- Seed investment/pioneer project in under-developed neighborhood
- Confidence that project will occur in a reasonable time-frame.
- Fits with Mayor's economic development strategy
- Project greater than $20 million
- Total increase in real property taxes
- Tax increase large enough to pay back bonds
  - Maximum time frame of 30 years
  - Less than total incremental tax increase is used to pay back bonds
- There is a market to sell bonds.

Once reviewed by BDC, the TIF needs Mayoral approval before going to the city council to become an ordinance. In Baltimore, TIFs have focused on single development projects, as opposed to including multiple landowners and sites. Below is a table providing information on the four existing TIFs in Baltimore.

Development	Project Description	TIF Projects	TIF Project Cost
Harborview	500 unit residential and marina	New bulkhead and public promenade	$5 million
Strathdale Manor / Frankfurt Estates	120 homes	New streets and utilities	$3.9 million
Clipper Mill	Mixed use 17+ acres	Streets, sidewalks, utilities	$5.5 million
Belvedere Square	100,000 square foot Shopping center	Streetscape improvements	$2 million

F. TRANSPORTATION DEMAND MANAGEMENT PROGRAMS

Changing travel behavior to use the existing transportation infrastructure more efficiently is the third theme discussed in this paper. This section considers voluntary and regulatory programs to promote transportation demand management (TDM) programs.

In order for TDM programs to be successful, cities must provide viable alternatives to single-occupancy vehicle travel. Cities must be planned to allow for trips to be made by foot and transit needs to provide safe and efficient service that connects where people want to travel. Without alternatives to driving alone, it is impossible to make any significant in-roads in reducing traffic congestion using TDM.

1. Transportation Demand Management

Transportation demand management (TDM) is a broad-reaching set of strategies for managing a multi-modal transportation system. TDM tools do not focus on increasing transportation infrastructure (i.e., roadways and sidewalks), instead they focus on managing and enhancing the use of existing infrastructure. TDM strategies promote the use of alternative transportation (e.g., ride-sharing, use of public transportation, biking

and walking) and trip reductions through telework or alternative work schedules. TDM strategies include:

- Parking management
- Providing on-site amenities
- Rideshare matching
- Transit subsidies
- Flexible work schedules
- Incentive programs.

Support strategies, such as education, marketing, and incentive programs, can have major impacts on the effectiveness of the core TDM strategy, increasing participation by two to five times.[14] While there are limits to what can be done to get people out of their single-occupancy cars, ongoing awareness and reshaping of programs are needed to reinforce the availability and benefits of alternative transportation options.

a. Analysis

Transportation demand management strategies such as those stated above can be implemented in a number of ways. Cities, metropolitan planning organizations (MPOs), and states can hold the primary responsibility for TDM, with various strategies promoted by different departments and divisions within the respective agencies, and incorporated into the building approval process or zoning. Some areas have commuter resource organizations (e.g., RIDES for Bay Area Commuters, Commuter Connections in DC, or Downtown Minneapolis Transportation Management Organization), which provide a broad array of TDM specific services and are generally government funded, with support coming from state, regional, or municipal sources.

Another means of providing TDM include transportation management associations/ organizations (TMA/Os), which are generally non-profit membership organizations focused on serving a specific geographic area. One of the challenges of providing transportation demand services through a TMA is that the programs they support are only available to employees whose companies that are members. (In some cases, TMA-operated shuttles may be open to the public.) A TMA's focus on a specific geographical area allows them to choose tools applicable to its specific circumstances. Chambers of commerce or other multi-issue business coalitions may also be appropriate organizations with which to promote TDM programs, but again, may only serve member organizations.

While TDM strategies are designed to encourage use of alternative transportation, use of the services is optional and cannot be forced on employees or residents. As a part of development approvals, cities can require businesses/developers to implement TDM strategies, but monitoring whether these strategies are implemented is a major challenge.[15] This is especially true when the developer is not the tenant(s) or if ownership changes hands.

[14] From the Boulder Transportation Master Plan Update, Transportation Demand Management Quick Primer. 1996.
http://www.ci.boulder.co.us/publicworks/depts/transportation/master_plan_new/pdfs/1996pdf/TDM_Quick_Primer.pdf

[15] See trip reduction ordinances and negotiated agreements for examples of monitoring programs.

b. Examples

Seattle has set up a strong TDM program that could serve as a model for other cities, both with respect to their overall program, but also as a resources for specific projects. In addition to developing programs designed to promote commuter trip reduction (King County Metro's Employer Commute Services and Job Access Transportation Program), the city has pioneered efforts to reduce non-commute travel with programs branded under the umbrella of Way to Go, Seattle! Some of the most successful programs include:

1. ***One-Less-Car***, which provided financial incentives for participants to leave their second car at home and keep a travel journal during the study period. The project convinced many participants that they did not need the second vehicle and led to positive impacts beyond the study group because of high levels of publicity.

2. ***Car Smart Community Challenge Grants*** provided up to $5,000 for communities (business groups, non-profits and neighborhood associations) to implement their own neighborhood trip reduction projects. Projects included bicycling and walking guides, event-related promotions and special transportation services. The City provided web-based assistance for developing project ideas and links to resources. Projects varied in their effectiveness, but received a positive response for allowing creativity and focus on specific areas.

3. Additional programs focused on ***high schools and downtown business*** employees and customers. Positive exposure from the media of *Way To Go, Seattle!* programs provided a message that reducing automobile ownership and use is feasible and rewarding. Responses from participants, local residents, the media and officials from other communities indicate that the message is effective.

The following lists the lessons learned during a program evaluation of *Way To Go, Seattle!* [16] These concepts should be considered when developing TDM programs in order to focus efforts efficiently.

- Projects tend to be more effective if they convey the message that typical households can feasibly reduce their vehicle ownership and use, and will be better off as a result, seeing benefits including financial savings, reduced stress, increased exercise, and more livable communities.
- No single transportation alternative will be appropriate for all users or all trips. Projects that support and encourage use of a variety of transportation options can provide greater benefit and convey a more positive marketing message than programs that only support and encourage use of a single transportation option.
- Projects that improve transportation options and rely on positive incentives tend to directly benefit participants.

[16] Victoria Transport Policy Insitute and CH2M Hill. *Way to Go, Seattle! Program Evaluation.* July 2002. http://www.ci.seattle.wa.us/waytogo/4-Evaluation%20&%20Results/Way%20to%20Go%20Programs%20Evaluation%20-%20Report.pdf

- Projects that result in reduced car ownership (rather than just reducing car trips) tend to be particularly beneficial. Without a vehicle (or second vehicle) travelers cannot make trip-by-trip decisions as to whether to drive or use alternative means.
- Projects that help young people reduce their automobile use and learn about alternative modes can have significant long-term benefits, although it is difficult to know how great this impact will be, or where it will occur (a program that helps teenagers use transit may result in lifelong reductions in driving for some people, but they may move to another region).
- Shifts from driving to non-motorized travel, and strategies that reduce total physical travel (such as telework) provide the largest benefits (congestion reductions, parking cost savings, improved health, and energy and emission reductions). Shifts from driving to ridesharing and transit provide moderate benefits (congestion reductions, parking cost savings, safety benefits, and some energy and emission reductions). Finally, shifts to smaller or more fuel-efficient cars provide modest benefits (mainly energy and emission reductions).
- Projects that help reduce urban-peak trips provide more benefits than programs that reduce off-peak trips.

The **City of Boston** relies on **TMAs** for much of its TDM efforts. There are six TMAs serving different areas of Boston. The services provided by each TMA vary but include guaranteed rides home, transit pass purchases, transportation awareness days, shuttle bus services, information kiosks, transportation advocacy programs and information to commuter service programs.

A non-profit business coalition, the Medical Academic and Scientific Community Organization (MASCO) runs one of the largest and most effective TMAs in Boston, CommuteWorks. MASCO serves the 200-acre Longwood Medical Area, which includes 21 hospitals, universities, and cultural and religious institutions in the area. These institutions employ over 35,000 people, enroll 15,000 students and serve over one million patients annually. With that many people in such a small area, one of MASCO's main focuses in on providing adequate access. To that end, MASCO manages parking lots, runs three shuttle routes plus four park-and-ride services and provides TDM programs to all member organizations. In addition, MASCO works with the Boston Department of Transportation to develop Transportation Access Plan Agreements (TAPAs)[17] for new development and also with the local transit provider, Massachusetts Bay Transportation Authority (MBTA), to advocate for improved transit service. MASCO meets with MBTA monthly, which has recently led to added commuter rail service.

CommuteWorks is able to develop TDM programs by leveraging their control of parking and transit options. Some of the most successful programs are those that have provided subsidized transit for a three-month period to people who currently drive, with the guarantee that they can have their parking space back if they choose not to continue to take alternative transportation after the program ends. Of the twenty-six participants, 89% gave up their parking space at the end of the program and continue to use public

[17] See the Boston case study within section "Negotiated Agreements."

transportation. As a measure of their overall success, 25-30% of staff and students walk or bike to Longwood with another 39% of trips by transit. Citywide, 33% of Boston residents commute by public transit and only 14% use non-motorized means. Single occupancy travel to the area has decreased 11% since CommuteWorks began ten years ago.

Since TDM programs provided by TMAs have been successful in Massachusetts, the Commonwealth is shifting its efforts to provide TDM programs to all employees, regardless of their employers' interest in joining a TMA.

c. Applications in Baltimore

Before beginning a summary of current TDM programs in Baltimore, it is useful to have a context for alternative transportation use. Baltimore currently falls in the upper third of major U.S. cities[18] with regard to alternative transportation commuting. The following table provides a summary of commuter modes from the 2000 Census.

Commute Mode	Modal Share	Rank[18]	Change since 1990
Walk	7.28%	7th	-0.29%
Bicycle	0.34%	18th	+0.09%
Transit	19.94%	7th	-2.46%
All Alternative Modes	27.56%	8th	-2.66%
Car-less population	35.89%	3rd	-2.46%

It is interesting to note that alternative transportation use has decreased in close proportion to the decrease in households without a car. This could be interpreted that much of the use of alternative transportation is by people without access to a car, as opposed to those choosing to use alternative transportation who have a car. In order for alternative transportation to be used as a congestion management tool, alternative transportation options need to be financially advantageous and time-comparable to driving alone.

Baltimore City provides a number of TDM programs including educational programs, ride-matching, tax credits and housing choice benefits. The city been able to integrate TDM programs into a variety of organizations, but has only one full-time staff member dedicated to TDM. The lack of staff dedicated to implementing TDM programs limits the city's ability to promote existing services or create additional programs, therefore limiting the ability to see positive TDM outcomes.

The following table provides a summary of TDM programs available for residents and businesses in Baltimore. Currently, there are no TMAs in the city of Baltimore but the BWI Business Partnership, Inc. and Annapolis Regional TMA serve areas nearby. A TMA serving Baltimore County has expanded from its base of transportation into a general business issues organization, another possibility for encouraging transportation management.

[18] "Major cities" are defined as those 29 U.S. cities with populations greater than 500,000.

PROGRAM	ORGANIZER	PROGRAM DESCRIPTION
Ride-share coordination	BCDOT	A regional database is used to match commuters with carpools or vanpools.
Carpool priority parking	BCDOT	The city provides priority parking in metered lots downtown.
Employer Outreach	BCDOT	The rideshare program coordinator provides assistance to employers and neighborhoods in promoting alternative transportation initiatives.
	BDC	Provide commuter information to businesses.
Clean Commute Month	Clean Commute Partnership	During May, Partnership organizations participate in local festivals, sponsor bike to work clinics and provide additional employer outreach.
Commuter Transit Benefits	Federal MTA	A company can subsidize up to $105 of commuter benefits monthly, which are deducted from the company's taxable income. Alternately, the employer can allow their employees to set aside an equivalent amount of pre-tax dollars for commute benefits.
Maryland Commuter Tax Credit	State	Employers can claim up to 50% state tax credit for employer subsidized commuter benefits including transit passes, vanpools, Guaranteed Ride Home[19] and cash-out parking reimbursement.[20]
Live Near Your Work	Live Baltimore	Baltimore City and the employer each provide $1,000 to assist employees purchase homes within specific local neighborhoods.
Smart Commute Initiative	Live Baltimore	The transportation savings of living near transit are considered when determining the homebuyers qualifying income when purchasing a home within ½ mile of a rail station or within ¼ mile of a bus stop.

2. Trip Reduction Ordinances

Trip reduction ordinances (TROs),which mandate TDM strategies, place a legal commitment on transportation demand reduction. Program requirements may vary based on company size. Some require specific programs to be adopted while others allow flexibility in meeting specific commuting goals, such as having an average number of employees per vehicle or having a certain percentage of employees not commute by single occupancy vehicle during peak travel.

a. Analysis

TROs require on-going efforts by both a city and its employers to manage and implement programs. Many TROs require employers to provide annual progress reports to the city and may require the company to designate a program coordinator. Some TROs specify penalties for non-compliance, although these are rarely enforced. TROs provide an opportunity to place some of the responsibility for traffic reduction on companies and their employees, as opposed to leaving the city solely responsible for its promotion. Each business may be allowed to develop creative solutions in meeting the challenges of their

[19] Guaranteed Ride Home is not currently available in Baltimore.
[20] For more information on the Maryland State Tax Credit: http://www.mdot.state.md.us/CommuterChoice/What%20is%20Commuter%20Choice/HowCCMDtaxcreditworks

specific workplace. While many companies are receptive to providing traffic reduction tools, some require more assistance from city TDM program staff either from lack of knowledge or lack of interest. Having proactive city staff and easy-to-implement programs reduces the burden on the employers and makes the efforts more effective.

While this tool may not be focused on development, TROs may require developers to include infrastructure that will facilitate traffic reduction. Large residential developments may be required to include vanpool park-and-ride facilities or transit stops and businesses may be expected to include transit connections, bike parking, and preferential parking for high-occupancy or car-sharing vehicles. The Environmental Protection Agency provides the following example of how TROs can create conditions that reduce traffic.[21]

> An engineer commutes in a vanpool from a townhouse complex in the suburbs. Under the local TRO, the developer was required to provide a vanpool park-and-ride facility because more than 100 people live in the complex. The employee rides in the vanpool because he found out about its benefits at work, through an information seminar mandated by the same TRO. The van drops the employee at the company's designated vanpool parking area, which was required because the employer has greater than 500 employees on-site. The eight people riding in the van used to drive to work individually, so the vanpool reduces by a large fraction the congestion, energy use, and emissions that had been generated by the eight commuters.

b. Examples

Washington is the only state that currently requires trip reduction plans and programs from municipalities and major employers. They have developed a model TRO ordinance for cities.[22] Trip reduction plans were required in California from 1990 to 1995, but were made voluntary in 1995. Many municipalities in California still use TROs to obtain air quality compliance. Montgomery County, MD is a local example of a jurisdiction with a TRO.

Santa Monica, California uses its TRO to manage air pollution and traffic congestion. City ordinance 1604 requires employers to submit annual transportation plans to the city, with varying requirements for businesses of ten to forty-nine employees and fifty or more employees. The former must provide each of their employees with information about ridesharing, educating their employees about air quality issues and alternatives to driving alone to work everyday. Larger businesses employing more than fifty people must develop a plan to reduce single occupancy travel so that there is an average of 1.5 persons per vehicle during commute hours. Participating companies pay an annual per-employee fee, which is used to administer and enforce the program. Employers are required to survey employees annually to monitor compliance with their plan. In addition, Santa Monica is the only city in the nation that has a mandatory parking cash-out program.

[21] "Trip Reduction Ordinances" Transportation Control Measures Program Information Directory. http://yosemite.epa.gov/aa/tcmsitei.nsf/0/0451ced2b5f561ff852565d900782f52?OpenDocument

[22] www.wsdot.wa.gov/tdm/**tripreduction**/ download/ModelOrdinanceFINAL.doc

Large employers who lease parking and subsidize the cost wholly or partially, must offer employees the option of taking the parking subsidy in cash.

Maryland's **Montgomery County** has recently established four transportation management districts and is planning to set up a fifth as part of its TRO. [23] Commuting goals have been identified for each of the districts. These goals represent the percentage of commuters not driving to work alone during peak travel times and were set to be consistent with acceptable traffic conditions.

The TRO requires employers with 25 or more employees to implement traffic mitigation plans (TMPs). Companies are required to have a TMP contact person and submit annual activity reports to the County; post information about transit, ridesharing options and ADA information; provide a "guaranteed ride home" program; participate in annual commuter surveys administered by the County; and give TDM presentations to their employees. Montgomery County has developed additional TDM programs that companies can elect to participate in.

Montgomery County has made these programs easy to implement. They can provide display racks and brochures to companies and are willing to make presentations to employees and advise companies on how to implement new programs. The County is currently beginning its enforcement phase, which applies a $75 per day penalty on companies that do not submit TMPs. The County survey is used to monitor the program success and determine if each of the districts is meeting its traffic reduction goals.

c. Applications in Baltimore

Baltimore City does not currently have a trip reduction ordinance although the State of Maryland tried to implement a TRO in the 1992. Business and local government opposed the regulation, which was rescinded but has left a negative impression of their use. Even still, Montgomery County has been able to implement a local ordinance, helping show that TROs may be politically feasible.

G. FLEXIBILE MITIGATION

Negotiated agreements categorized separately from the other tools because of the flexibility in both topic and stringency. Negotiated agreements have stronger regulatory requirements than city-sponsored voluntary programs but are more flexible than other highly structured mandatory initiatives, such as impact fees. Since negotiated agreements are project-specific, it is important to link the required mitigations to project impacts via a traffic impact study.

1. Negotiated Agreements

Negotiated agreements are a common development impact mitigation tool. For projects that meet a size threshold, developers are required to prepare a traffic mitigation plan in order to obtain a needed permit. Since the agreement is negotiated, it may incorporate a

[23] Montgomery County's TRO program is run by the Montgomery County Commuter Services Section (301)770-7665. Laura Chinn, of the Friendship Heights Transportation Management District, was interviewed.

broad range of transportation management tools including payments, building infrastructure or adopting specific ongoing programs. Often the requirements are based on the specific impacts identified during the TIS, such as adding traffic lights or turning lanes to deal with the additional traffic created. In other cases, the agreements may be focused on directing the developer to meet broader city policies as described in city policy documents (e.g., comprehensive, neighborhood, or transportation plans.) This may include building transit shelters, minimizing the amount of parking constructed, joining a transportation management association or subsidizing transit passes.

a. Analysis

Negotiated agreements are extremely flexible in that they are less prescriptive than impact fees or traffic reduction ordinances. With negotiated agreements, mitigations required to offset the transportation impacts of development can be rapidly revised to respond to changes in policy or physical conditions. If a city is in the process of developing a traffic management system, it can require developers to provide network cables, traffic cameras or new compatible traffic signals as a part of the negotiated agreement. At other times or in other neighborhoods, a city may focus mitigation strategies toward transit-oriented facilities and connections.

One challenge of negotiated agreements is that it can be difficult to set a "baseline" of what is expected. Early in the process, developers may be unwilling to agree to the city's expectations. The organization responsible for approving the permit (e.g., Planning Commission or City Council) may be pressured to approve the development without requiring that the developer mitigate its impacts. Strong leadership throughout the city is needed to ensure that developers are held responsible for mitigating the impacts of what they create.

Follow-through and enforcement of negotiated agreements can be difficult. It is relatively straightforward to monitor physical infrastructure mitigations that are built in conjunction with the primary development project since the project is monitored during construction anyway. Requirements that include ongoing implementation can be more challenging to enforce since negotiated contracts usually do not have penalties associated with them and since a development has already been built, there is little incentive to follow through with agreements to provide transit subsidies or join a TMA. This is especially true when a developer leases the building to tenants. With little consequence for non-compliance, cities do not often make staff time available to determine whether agreements have been kept.

b. Examples

The **City of Boston** provides one example of flexible negotiations regarding mitigation activities. Boston requires Transportation Access Plan Agreements (TAPAs) for projects greater than 50,000 square feet. Developers are required to complete a TIS that consists of traffic management, parking management, construction management, and monitoring elements. Developers must identify the impacts of their project both during and after construction and recommend mitigation solutions. Based on the study findings, the developer and Boston Transportation Department sign a TAPA that identifies city- and developer-based mitigations, before development permits are issued.

Boston's ordinance allows for flexibility through negotiations between the city and developer in mitigating the transportation impacts of the development. The city does not have thresholds or specific mitigation measures that are required. TDM strategies and equipment needed to expand the Traffic Management Center, such as pan-tilt-zoom cameras, signal equipment and fiber optic cable have been the primary TAPA requirements recently.[24]

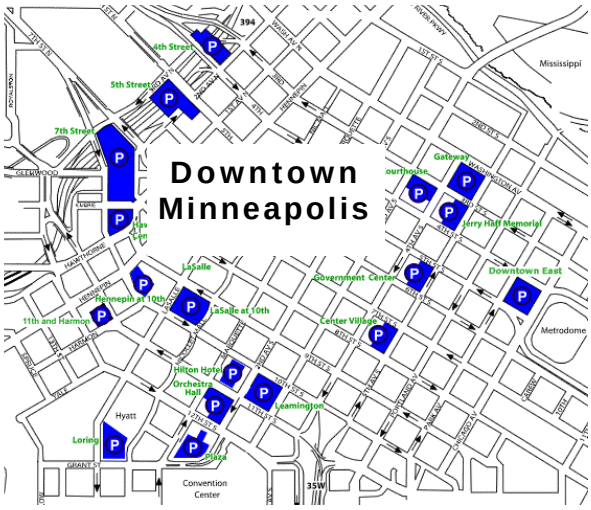
Minneapolis' Travel Demand Management Plans (TDM Plans) evolved from the existing traffic mitigation requirements, which were focused on level of service (LOS) and site access. In 1999, the newly adopted Comprehensive Plan and Zoning Code (535.140) codified specific TDM Plan requirements for all new commercial developments of 100,000 square feet or more.[25] TDM Plans are required to (1) list all the goals and policies of the City applicable to the project, and commit to further these goals through the TDM Plan, (2) disclose the short- and long-range supply and demand factors, and the transportation impacts of the project for all access modes, and (3) present implementation measures which must include a communications component. Goals for use of alternative transportation are set based on business location and type and are meant to be aggressive but not unrealistic.

When the TDM Plans were first required, developers struggled to accept the requirements. The city has been able to communicate how the requirements connect to city-wide goals and policies, and that they are necessary in order for the development to be approved. As the program has evolved the city has only met strong resistance from one of over 50 developers.

In order to meet the city's "Transit First" policy, TDM plans often focus on limiting the amount of free parking within a development and having businesses subsidize transit for their employees. The city has developed a number of parking garages at the periphery of the downtown (see figure on next page), in order to accommodate vehicle travel while minimizing the amount of downtown space allotted to parking. By managing a large portion of parking capacity, the city has control of the number of spaces, where they are, and how much to charge, which can be leveraged to encourage people to use alternative transportation. Developers benefit economically from this arrangement since constructing parking is very expensive in downtowns where land is at a premium. In effect, the city subsidizes the cost of building parking.

[24] "Guidelines by the Boston Transportation Department for use by the Zoning Board of Appeal" http://www.cityofboston.gov/transportation/pdfs/tapa.pdf

[25] The Public Works Department has jurisdiction to require TDM Plans of other development if it feels they are necessary and requests them of residential developments of approximately 50 unit or more and existing large traffic generators that have expansion plans even when those plans are for less than 100,000 square feet.



Commercial developers are often concerned that they it will be difficult to rent out space if they build limited parking. Minneapolis reduces the desirability of adjacent parking by requiring developers to disassociate the cost of parking from living or business space as a part of their TDM Plan. This encourages businesses to allow employees to find alternatives means of coming to work, be it walking, biking, transit, or parking in the city-owned garages.

With developments including limited employee parking, the city requires that developers participate in MetroPass. Employees are able to purchase annual transit passes for 50% off, with half of the subsidy paid for by their employer and half absorbed by the transit authority. For employers who are reluctant to agree to subsidize transit, the City points to the amount that the employer subsidizes the few employees for which it does provide parking. In one case, the employee spent $16 million for the 23% of employees for which they provided parking and had been willing to invest less that $50,000 for the other 71%, a ratio of 1,000 to one. In addition the city reminds the developer that the City subsidizes the parking costs of the company's employees who use the public garages. As a result, companies have had little success in trying to argue against these realities.[26]

As time has passed, developers have become far more willing to invest in TMD measures. The first draft TDM Plan had a value of $19 per employee. By 2001, employers spent $830 per employee on non-parking transportation benefits. Minneapolis has a strong Downtown TMO, which assists developers in providing services to meet their TDM Plan objectives. By surveying employees every two years as to what TDM programs they would participate in, Minneapolis continues to work with companies to evolve their TDM Plans and provide additional alternative transportation benefits. Minneapolis has the third highest rate of commuting by alternative transportation for cities with populations between 250,000 and 500,000 at 24%.

c. Application in Baltimore

In Baltimore, transportation-related negotiated agreements are usually negotiated as part of the site plan review process and deal with issues of site circulation, queuing space, and driveway location. As noted in the Traffic Impact Study discussion, when off-site mitigations are requested, there is usually a clear benefit to the developer.

[26] Orange, J Michael. "Travel Demand Management Planning in Downtown Minneapolis" American Planning Association 2001 National Planning Conference, New Orleans. Session: Sustainability in Minnesota (March 11, 2:30pm) http://www.asu.edu/caed/proceedings01/MINSOTA/orange.htm

H. FUTURE APPLICATIONS IN BALTIMORE

The variety of tools discussed in this paper can help Baltimore become a revitalized city while achieving a successful balance of both managing development and addressing development's impacts on the transportation system. Before applying particular tools, however, Baltimore needs to evaluate its strategic vision and set priorities that will define the steps to achieve the revitalization that the city wants.

Having effective planning tools in place will allow Baltimore and potential developers to focus on appropriate mitigations for each project in accordance with the stated transportation goals for that area. Transportation demand management (TDM) strategies that reduce driving and parking demand or bus service improvements that make transit ridership more attractive can be encouraged or required in areas where the City has chosen to allow higher levels of development. New traffic signals, increased off-street parking, and examination of possibilities for increasing roadway capacity can be the focus in areas where driving-oriented development patterns are planned. And in many areas, of course, some combination of the above mitigation patterns may be appropriate. Specific opportunities that can effectively address these issues are explained below:

1. The Benefits of Planning Tools

Planning activities play a fundamental role in determining and justifying key decisions for the future. Decisions which can impact development and transportation should be analyzed thoroughly using the proper tools and with maximum of input from a variety of stakeholders. Baltimore can benefit from adopting effective planning tools like those recommended below. These tools can lead to:

- Increased certainty for developers seeking permits, (more certainty, various planning tools)
- A perception of increased transparency and accountability of city government for residents concerned about the pattern of development approvals, and
- For city officials, a stated guideline to refer to when decisions on the emotional topic of development come under fire.

Comprehensive Plans As described earlier, comprehensive and neighborhood plans can be used to predict the impact of future changes on development, transportation, housing, employment, and other variables. These plans can help to determine what levels of development are acceptable in each given area. Baltimore and its' communities need to work together to determine what kind of development is best placed in what location (e.g., where 20-storey buildings are acceptable and where 4 floors are preferred). The transportation elements of these comprehensive plans can be used to specify where it is important that each person be able to drive and park easily, or where buses or bike lanes should have priority.

Policies When land use and transportation planning policies are considered simultaneously the examination of the impacts of development and transportation on each other and the tradeoffs that need to be explored can be clearly identified, leading to

optimal results. For example, if relatively more development is desired in a particular area, then it will need to be understood that the street network and parking facilities in that place most likely will not be adequate to handle the increase in traffic. Instead, mitigations might focus on improved transit frequency, a safer and more attractive sidewalk network, transit priority lanes, and preferential parking for carpools.

Transportation Demand Model Volpe's detailed refinements of the existing region-wide transportation demand model have enhanced its analytical capabilities for the Southeast region. This model could be refined further to make it applicable to the entire City, or to other specific regions within it. The City can maximize the benefits of using a comprehensive model by testing different potential mitigation options, predicting their impacts, and revising mitigation recommendations or requirements accordingly. Modeling will also allow the City to represent car trips and person-trips explicitly and thus more fully compare roadway mitigations with those intended to reduce trips in low-occupancy vehicles.. These types of analyses can help the City, developers, and consultants determine optimal mitigation.

Street Classification System Baltimore's current classification system addresses the standard roles of City streets (arterials, access roads, etc.). More enhanced tools such as a multi-modal street classification system can allow Baltimore to reevaluate and redefine (where needed) the purpose of streets and the preference for how it will be used. The City can use that determination to analyze further changes or implications from planning models. This multi-modal classification system can help to outline where cars, transit, pedestrian, and bicycle should have priority, or where they should share the road. Additionally, a network-level review of truck routes would help direct local truck traffic, benefiting businesses and citizens. The determinations made by the classification system should be applied to the larger comprehensive model so that it is consistently taken into account when decisions are made. The benefits of this application can create a network approach to roadway classification that considers adjacent uses and might find a more appropriate location for directing through traffic than through specific residential streets. Conversely, land along roads can be developed to compliment the roadway use, such as having higher density housing and commercial development adjacent to streets designed to accommodate transit or higher levels of traffic.

Traffic Impact Studies (TIS) The city could develop more detailed thresholds for development to ensure that projects with significant trip generation are required to complete a TIS. Currently, the guidelines recommend TIS for "all other projects that would exceed 50,000 square feet or projects that would generate 100 vehicles or more in peak hours." Shopping centers can produce peak travel demands of 100 vehicles per hour with as little as 6,000 square feet. While smaller shopping œnters are covered by the peak traffic generation clause, they could easily be overlooked due to their small floor area. To support broader strategic planning and ensure that the impacts of particular and cumulative development align with the expected impacts of the neighborhood plan, TISs should be required for subdivision and development plan applications, zoning change applications and all large projects that require site plans. In addition TISs may be used to support other tools and programs the city decides to implement. If the number of TISs is expected to overwhelm the staff, a TISs review fee could be used to pay for outside consulting assistance.

A comprehensive planning framework balancing expected development with targeted mitigations allows the city to move on to the stage of planning these mitigations armed with the most information possible to establish and manage its choice of programs. As different parts of Baltimore are likely to be redeveloped at different times, the City can adopt a framework for facilitating and managing a successful revitalization process and use it in succession for each area. The following is a discussion of several mitigation strategies that might be part of the choices targeted in different cases.

2. Infrastructure Financing Considerations

Developers need to feel that Baltimore City provides a better business climate than other potential development sites. Factors in this determination include the magnitude of likely profit but also the predictability, ease, and equity of the permitting and review environment. A solid planning framework can increase the attractiveness of the area for developers by making permitting and approval decisions more standardized and streamlined. At the same time, the City needs to use its limited resources efficiently. One strategy would be to offer tax increment financing (TIFs) as incentives for pioneering developments. After development of a particular area is set in motion, impact fees could be charged. The following tools discuss key questions that should be considered in setting up and managing these infrastructure financing tools in Baltimore.

Tax Increment Financing Baltimore has used tax increment financing for four "pioneer" projects in areas struggling to develop. If not already done, the City may want to conduct an economic analysis to determine whether or not TIF supported projects have been able to stimulate additional development.

Impact Fees In areas where the development market is strong, either on its own or through city-based incentives, developers should have the responsibility to mitigate the traffic influx they are creating. Impact fees are one technique that is useful because it spreads the burden of infrastructure improvements over all developers working on projects in a given area -- from when the program is first instituted to when that area is completely redeveloped. Effective planning tools, including comprehensive and neighborhood plans with transportation elements and a multi-modal street network classification system, allow the City to balance the fee structure by predicting the extent of the projects that are likely to occur until full build-out is reached.

One of the major hurdles that Baltimore may face in trying to implement impact fees is that development in many parts of the city is happening (or will happen) in an area with an existing transportation network, with little room for expansion. Impact fees are generally used to pay for roadway projects and other infrastructure. While some examples of impact fees in central business districts have been found, these examples appear to be limited to areas where development is flourishing and impact fees are widespread. The Volpe Study of the Southeast will provide the build-out scenario and potential infrastructure improvements that should be weighed to determine whether an impact fee is appropriate there. Additionally, this analysis can also determine if impact fees would be appropriate in the future for other areas of the city with constrained street networks, such as West Baltimore, that may have an interest in development.

3. Transportation Demand Management Programs

In some settings, the most efficient manner for dealing with increased trips resulting from new development may be to focus on reducing car trips and providing other attractive transportation options. In many cases this can allow higher development levels, with the development's understanding that it will not be able to market easy car access and parking but will be able to advertise convenient transit and pedestrian access instead. Baltimore will need to determine how best to support this goal where desired. The following discusses key considerations that should be made in setting up effective transportation demand management (TDM) programs in Baltimore.

Transportation Demand Management The road network in Baltimore is constrained and has limited opportunities for expansion. TDM is key if the City would like to add development. An analysis of current travel patterns and an understanding of mode preferences may provide insight as to which types of TDM strategies would be most effective. Such analysis may also identify where there are gaps in alternative transportation services such as inefficient or unreliable bus routes or limited bicycle infrastructure.

Programs focusing on specific modes or specific neighborhoods can educate groups about opportunities that may benefit their location or interests. These TDM programs, although funded by the City, can be managed by specific interest groups or neighborhoods to encourage public ownership of the solutions to address increased travel demand. For alternative transportation options to be successful, travelers must see time, cost, or quality of life benefits compared to driving alone. Educational and promotional programs such as those used in Seattle (see page 24) may be the most transferable to Baltimore to advertise existing alternative transportation programs and the benefits of changing travel behavior.

Modal Strategies Transit routing, service quality, and personal security are often identified as hurdles to using alternative transportation. The fact that the local transit is run by the state transit agency, Maryland Transit Administration (MTA), and safety and security are the responsibility of the police department, poses a challenge to the DOT in mitigating these hurdles. While these activities have traditionally been beyond the scope of the DOT, it is imperative that it finds ways to work with these organizations to make improvements. DOT's mission is to "provide the City of Baltimore with a comprehensive and modern transportation system that integrates *all modes* of travel…" In order to do this, it will have to move beyond its traditional focus of serving the automobile.

Trip Reduction Ordinance (TRO) With the City classified as a non-attainment area for ozone levels by the Environmental Protection Agency, a TRO could be implemented to reduce congestion and improve air quality. A TRO could be applied to business in all of Baltimore, or to businesses in specific neighborhoods such as downtown or the southeast. While a TRO can create significant changes in travel patterns, adequate programs need to be in place that support alternatives. Appropriate transit services, facilities for carpooling or vanpooling, safe walking routes, and bicycle infrastructure (routes and parking) would be needed to promote changes and see successful results.

TRO goals must consider the transportation and economic realities in which they are set. If alternative transportation is not a reasonable option for employees, it can be impossible to meet specific levels of alternative transit use, regardless of the amount of effort and financial incentives provided by the employer. Baltimore would also need to consider the impacts a TRO would have on its rate of development. If a developer considers the financial and administrative efforts required to be in compliance with the TRO as excessive, they may choose to develop outside of the city.

A successful TRO policy may require Baltimore to change the way parking is managed in the city, add TDM requirements to the zoning code such as park and ride facilities or shower-rooms and bike racks, and improve transit service and bike and walking routes to make using alternative transportation modes attractive and feasible.

4. Flexible Mitigation

Other tools, like negotiated agreements, are more versatile than those previously listed because they provide flexibility in both topic and stringency. They have stronger regulatory requirements than city-sponsored voluntary programs, but are more flexible than other highly structured mandatory initiatives, such as impact fees. Since negotiated agreements are project-specific, it is useful to link the required mitigations to project impacts via a traffic impact study.

Negotiated Agreements In order to implement a strong program of negotiated transportation mitigation agreements, the DOT would need to have support from the Mayor and Planning Commission. The City Zoning Code includes provisions to ensure that facilities are adequate before development is approved.[27] With city support, the zoning code could be used to create negotiated agreements for the development of specific facilities; it is recommended, however, that stronger ordinances be put into place so that expectations of developers are clear. As noted in the Minneapolis case study, negotiated agreements may need to be implemented incrementally, working up to the desired mitigations. The stronger the economy and the stronger the support from the city, the easier it will be to implement negotiated agreements.

In order to make the most of negotiated agreements, the city must have a strong plan for mitigating the impacts of development. TDM, traffic signals or additional right-of-way, or improvements to a traffic management system such as those requested by Boston are all options. The city must determine what would be most useful in meeting its long-range vision.

I. CONCLUSION

The most effective tools to address development focus limited city-resources toward areas that most need assistance. In economically prosperous areas in which markets are strong, Baltimore has the ability to control development more stringently and can often place higher demands on developers. Although requiring developers to mitigate their

[27] (9-112 for PUD or for Non-conforming or especially conditional uses (31- and 14-Cite code)

traffic impacts effectively leads to increased costs for the developer, the benefits will lead to increased accessibility and less frustration from patrons. In weaker markets, added costs may cause developers to refocus their efforts toward areas without the requirement to mitigate impacts. Finding the balance between providing incentives and making demands on development is often challenging, however, this balance must be addressed to ensure the City's revitalization leads to optimal success.

One of the reoccurring themes identified during Volpe's research of effective tools is the importance of documentation and sequential activity. Clearly stating goals and policies provides a common understanding of expectations and a framework from which city decision-making and activities can take place. In order to best work with developers to build adequate transportation infrastructure, Baltimore needs to identify the limits of the existing system and potential options for improvement. Without a comprehensive plan for the transportation network, it is difficult to articulate the impacts individual developments have or ways that they can best address their impacts.

Having a straightforward process and a clear understanding of expectations is important in attracting developers. Connecting city activities and requirements to identified needs and stated policies ensures that decisions are both rational and legally sound. Developers will be more willing to adhere to requests and requirements from the City if they recognize both the direct and indirect benefits of their efforts.

The tools described in this paper vary in the regulatory nature and the level of responsibility for change placed on the City. This variation recognizes that different tools are appropriate in different development contexts. Those tools that place more responsibility on developers may not be appropriate in areas struggling to attract development. While many developers may be "scared away" by requirements, the choice of where to develop is quite complicated. Many specific concerns can be rationalized by location-specific benefits such as transit access and reduced parking requirements. Infrastructure improvements can often provide better site access and transit benefits can reduce taxes and help attract quality employees. It is worthwhile for Baltimore to set high expectations of developers, allowing them to play an active part in making Baltimore City a better place to live and do business.

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